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CLAIMS

We claim:

1. A method for creating a target image with an animated microstructure, where the target image is made of a succession of target image instances which differ from each other by an embedded microstructure which evolves over time, the method comprising the steps of

(a) defining an original image;

(b) defining how the embedded microstructure evolves over the succession of target image instances;

and

(c) rendering from the original image a succession of target image instances comprising the evolving embedded microstructure.

2. The method of claim 1, where the shape of the animated microstructure is made more flexible by defining an additional microstructure warping step.

3. The method of claim 1, where only a part of the original image is rendered with an animated microstructure, that part being specified during an additional mask definition step.

4. The method of claim 1, where an additional step enables to specify a set of basic colors for rendering target image instances.

5. The method of claim 4, where the succession of target image instances is rendered by dithering at least one of the basic colors with a dither matrix embedding the microstructure and where the evolution of the embedded microstructure is defined by an animation transformation mapping between an animated dither matrix space and an original dither matrix space paved by the dither matrix.

6. The method of claim 5, where the embedded microstructure is made more flexible by an additional warping transformation mapping between a target image space containing the target image and the animated dither matrix space.

7. The method of claim 4, where rendering of target image instances is carried out by multicolor dithering with the defined set of basic colors and with a dither matrix embedding the microstructure.

8. The method of claim 7, where the evolution of the embedded microstructure is defined by an animation transformation mapping between an animated dither matrix space and an original dither matrix space paved by the dither matrix.

9. The method of claim 8, where the embedded microstructure is improved by an additional warping transformation mapping between a target image space containing the target image and the animated dither matrix space.

10 The method of claim 1, where the evolution of the microstructure over time comprises a blending between two microstructure shapes.

11. The method of claim 1, where the microstructure is selected from a set comprising logos, text, symbols and ornaments.

12. The method of claim 1, where the succession of target image instances is rendered by dithering separately at least one of the original image color layers with a dither matrix embedding the microstructure and where the evolution of the embedded microstructure is defined by an animation transformation mapping between an animated dither matrix space and an original dither matrix space paved by the dither matrix.

13. The method of claim 12, where the embedded microstructure is made more flexible by an additional warping transformation mapping between a target image space containing the target image and the animated dither matrix space.

14. A method for creating a target image with a microstructure evolving in successive image instances, comprising initialization and image rendering steps, where the initialization steps comprise

(a) selecting color information necessary for rendering the target image;

(b) selecting a microstructure;

(c) selecting of a time-dependent animation transformation allowing the microstructure to evolve over time;

and where the rendering steps comprise an update of the current instance of the animation transformation when a new instance of the target image is to be rendered.

15. The method of claim 14, where the initialization steps also comprise selecting a mask specifying regions of the original image that are to be rendered with the selected microstructure.

16. The method of claim 15, where a multi-valued mask expresses the weight of original image colors and the weight of the selected basic colors in the target image.

17. The method of claim 16, where color information is expressed as a set of basic colors, where the initialization steps also comprise a tetrahedrization of the color space according to said set of basic colors, and where the rendering steps comprise a conversion from original image colors to basic colors making use of said tetrahedrization.

18. The method of claim 17, where the initialization steps also comprise a 3D grid data structure pointing to tetrahedra intersecting individual grid elements, and where the conversion from an original image color C_r to basic colors is carried out by

(a) locating a tetrahedron enclosing original image color C_r;

(b) by expressing C_r as a barycentric combination of four basic colors C_a, C_b, C_c and C_d located at the tetrahedron's vertices; and

(c) by applying multicolor dithering to select from the four basic colors the color to be applied at a current target image location.

19. The method of claim 14, where the initialization steps also comprise the selection of a warping transformation.

20. A method for creating a target image with an embedded microstructure evolving in successive image instances comprising the steps of

(a) defining an original image, an original microstructure, color information used for rendering the target image and a time-dependent animation transformation;

(b) traversing a target image (x,y) pixel by pixel and row by row, determining corresponding positions in the original image (x',y') and, according to the time-dependent animation transformation, corresponding positions in the original microstructure (x'',y'');

(c) obtaining from the original image position (x',y') the color C_r to be reproduced and from the original microstructure position (x'',y'') rendering information;

(d) rendering the target image by making use of the rendering information.

21. The method of claim 20, where an additional a mask is defined whose values define which parts of the original image are rendered with an embedded microstructure.

22. The method of claim 21, where the mask values specify microstructure appearance properties such as visibility, position and spatial extension.

23. The method of claim 20, where the embedded microstructure is made more flexible by defining an additional warping transformation.

24. An image with an embedded microstructure evolving over time, where from far away mainly the image is visible and from nearby mainly the evolving microstructure is visible, and where said image is displayed as a succession of image instances, each image instance differing from previous image instances by the microstructure evolution.

25. The image of claim 24, where the visibility of the embedded microstructure is tuned by a mask whose values represent relative weights of an original image without embedded microstructure and a corresponding image synthesized with the embedded microstructure.

26. The image of claim 25, where the mask values evolving over time yield apparent changes in at least one of the embedded microstructure appearance properties selected from the set of visibility, position and spatial extension properties.

27. The image of claim 25, where contributions of original image and embedded microstructure image according to their relative weights are spatially distributed.

28. The image of claim 24, where the embedded microstructure is synthesized by a dithering method taking as input an original image and producing a dithered image, said dithering method being selected from the set of standard dithering and multicolor dithering methods.

29. The image of claim 28, where the visibility of the embedded microstructure is tuned by a mask whose values represent the relative weights of the original image and the dithered image.

30. The image of claim 29, where the mask values evolving over time yield apparent changes in at least one of the embedded microstructure appearance properties selected from the set of visibility, position and spatial extension properties.

31. An image animation with an embedded microstructure evolving over time, where from far away mainly the image animation is visible and from nearby mainly the evolving microstructure is visible, and where, when seen from nearby, frames differentiate themselves from previous frames also due to microstructure evolution.

32. The image animation of claim 31, where the visibility of the embedded microstructure is tuned by a mask whose values represent relative weights of an original image animation without embedded microstructure and a corresponding image animation synthesized with an embedded microstructure.

33. The image animation of claim 32, where the mask values evolving over time yield apparent changes in at least one of the embedded microstructure appearance properties selected from the set of visibility, position and spatial extension properties.

34. A computing system capable of displaying an image with an embedded microstructure evolving over time, where from far away mainly the image is visible and from nearby mainly

the evolving microstructure is visible, comprising a server computing system, where the image is stored as a sequence of image instances and comprising a client computing system capable of receiving the sequence of image instances from the server computing system and capable of displaying said sequence.

35. The computing system of claim 34, where the server computing system is a Web server and where the sequence of image instances is displayed by the client computing system within a Web page.

36. A computing system capable of displaying a target image with an embedded microstructure evolving over time, where from far away mainly the image is visible and from nearby mainly the evolving microstructure is visible, the computing system comprising a server computing system and a client computing and display system, where the client computing and display system receives from the server computing system as input data an original color image, microstructure data and microstructure evolution parameters and where the client computing and display system synthesizes and displays the target image with the embedded microstructure on the fly.

37. The computing system of claim 36, where the transmitted microstructure data comprises a dither matrix, where the microstructure evolution parameters comprise an animation transformation and where the target image is a dithered image generated by a method selected from the set of standard dithering and multicolor dithering methods.

38. The computing system of claim 37, where the microstructure evolution parameters also comprise a warping transformation and where the client computing and display system also receives from the server computing system as input data a mask whose values represent relative weights of the original color image and of the dithered image, the mask defining the position and visibility of the microstructure within the target image.